

1

2,908,269

ENDOTRACHEAL TUBE HOLDER AND BITE BLOCK

Peter Aiming Cheng, Wilmington, Calif., assignor to Sierra Engineering Co., Sierra Madre, Calif., a corporation of California

Application March 24, 1958, Serial No. 723,501

6 Claims. (Cl. 128—12)

The invention relates to surgical instruments and has particular reference to a bite block which is inserted in the mouth in order to keep the jaws spread apart a sufficient distance to permit the insertion of a resilient tube into the mouth and down the throat or trachea, depending upon the particular needs, without it being necessary to disturb the position of the bite block in the mouth during either insertion or removal of the resilient tube.

In those medical procedures which require insertion of a tube, for example, in the trachea, the discomfort to the patient is so excessive that some form of anesthetic is requisite in order to quiet the patient to a sufficient degree to permit insertion of the tube without having the patient gag. The most common and natural tendency also for a patient with a tube of the type described inserted is to bite upon the tube and thus close it against the flow of fluid either in or out. Also as long as the mouth may be held open of necessity while a tube is in place, saliva collects and the patient is apt to choke upon the liquids thus accumulating.

Medical science has recognized the advantages of techniques involving the insertion of tubes through the mouth into the trachea as well as the throat but the type and character of equipment heretofore available has made employment of such technique difficult and troublesome, especially under extraordinary circumstances.

It is therefore among the objects of the invention to provide a new and improved tube holder and bite block assembly which can be fastened in the mouth of a patient and which is of such character that a tube can be readily inserted through the mouth and removed therefrom without it being necessary to disturb the position of the tube holder and bite block.

Another object of the invention is to provide a new and improved tube holder and bite block which is of such design that it assures against the patient closing his jaws and teeth upon a resilient tube while at the same time permitting the patient to close his mouth to a certain extent and enjoy a reasonable degree of comfort during the procedure.

Another object of the invention is to provide a new and improved tube holder and bite block of such design and construction that when a resilient tube is inserted through the tube holder and bite block in the mouth, it can be locked in position at any stage of the procedure and held with a sufficient degree of firmness to prevent slipping in one direction or another, regardless of the accumulation of body liquids around the tube, the device being further of such character that the locking means for holding the tube can be readily manipulated with one finger or another of the surgeon's hand and thus greatly improve and facilitate the manipulation of the tube during the procedure.

Still another object of the invention is to provide a new and improved combination tube holder and bite block for application to the mouth of a patient undergoing surgical treatment, especially treatment needing

2

anesthesia wherein the tube holder and bite block is of transparent material, thereby permitting an immediate and accurate check on the color of the lips of the patient during the procedure as well as being one greatly facilitating the application of a tube, thereby to aid the anesthetist to a very considerable degree in the proper administration of anesthesia.

Also among the objects of the invention is to provide a new and improved tube holder and bite block assembly which is simple in its operation while at the same time rugged in its design and construction and also one which is of such character that it can be repeatedly sterilized not only by boiling but also by use of an autoclave.

Still further among the objects of the invention is to provide a new and improved bite block and tube holder device of such construction and operation that in the event of apnea the anesthesiologist can quickly install and hold the endotracheal tube while connecting the gas machine for immediate use.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a front elevational view of the tube holder and bite block assembly showing a tube applied thereto wherein the tube is shown in cross-section.

Figure 2 is a longitudinal sectional view of the device taken on the line 2—2 of Figure 1.

Figure 3 is a fragmentary elevational view of the device taken on the line 3—3 of Figure 2 but with the parts in unlocked position.

It is believed that an understanding and appreciation of the different problems involved in the use of this device will be of assistance in understanding the sundry combinations which comprise the invention.

The endotracheal tube holder and bite block assembly herein described is designed to serve a very specific purpose for the anesthetist in administering anesthetic gases to the patient by intubation, that is to say, the insertion of a catheter tube into the trachea through the mouth. As the name implies, the device is designed to hold the endotracheal tube in place after intubation and lock it so that the tube neither goes too deep nor slips out. The bite block arrangement is provided so that the patient can inadvertently or voluntarily bite down upon the bite block portion only of the device and thus be prevented from collapsing the endotracheal tube catheter by pressure of the teeth.

It is also necessary that the anesthetist observe the colorimetric quality of the patient's lips during administration and thereby be able to judge the nature of the patient's physiological well-being useful as a guide to the skilled anesthetist. Moreover, during such operations, time is important and the anesthetist must be able to work positively and rapidly which frequently means the exertion of considerable force in use of the tools. Hence, the design of suitable tools must take these factors into consideration.

In an embodiment of the invention chosen for the purpose of illustration there is shown a face plate 10 which is adapted to be held in place upon a patient by use of a strap 11 which is attached to the face plate by means of knobs 12. The knobs engage holes 13 in the strap and make it possible to readily remove the strap when desired.

The face plate itself is preferably made of some one of the currently available transparent plastic materials of which "Lucite" is an example. It will be noted that the

face plate consists of opposite sides 14 and 15 which join along a front angle 16 and that the angular disposition of the sides is such that they conform approximately to the shape of the face in the area of the mouth.

On the side 14 there is provided a hollow tubular stub 17 of rigid material which has an open inside end 18, an open outside end 19, and a bead 20 surrounding the inside end. The stub is anchored to the side of the face plate by an appropriate adhesive so that it is virtually an integral part of the material of the casing. The stub provides a passageway 21 through the face plate.

On the other side 15 of the face plate there is provided an open somewhat arcuate slot 25 which has an open end 26 on an upper edge 27 of the face plate. The inner or closed end 28 lies along the longitudinal center line of the face plate and adjacent the angle 16 the breadth of the slot is somewhat greater than the maximum anticipated outside the diameter of a catheter tube 29.

A locking plate 30 is pivotally mounted upon the side 15 of the face plate by use of a pivot pin 31. The locking plate is of special construction and includes a concave arcuate edge 32 conforming substantially to the size and shape of the outside circumference of the catheter tube 29. Extending along a substantial arcuate distance at the circumference of the locking plate is a metal shoe 33 which follows the contour of the edge 34 which in the chosen embodiment is concentric with respect to the axis of the pin 31.

A lock arm 35 has an elongated shape and is pivotally secured to the side 15 of the face plate by means of a rivet 36. The lock arm has a lip 37 which overlies the front face of the locking plate, thereby serving to maintain the locking plate and lock arm in proper relationship.

The lock arm is provided with an arcuate cam track 38 which is eccentric with respect to the axis of the rivet 36. The cam track 38 is adapted to roll against and cooperate with the shoe 33 which may likewise be appropriately designated as a cam track.

To further facilitate operation of the device a torsion spring 40 extending around the rivet 36 presses against the lock arm in a direction such as to normally bias the lock arm into locking relationship with the lock plate. This means a biasing of the lock arm in a clockwise direction, as viewed in Figures 1 and 3. It will be noted that a protuberance is provided on outer end 41 of the lock arm so that it can readily be manipulated by one of the fingers of the technician. Inasmuch as the lock arm tends to take a position determined by the presence of the locking plate, the lock arm may be appropriately made reference to as a follower or follower element. Normally the lock arm or follower element will tend to hold the plate locked in any selected position of rotation depending partly upon whether or not the lock plate is in engagement with a catheter tube or removed from engagement therewith.

In use the face plate is first strapped on the face with the stub 17 in the patient's mouth between the teeth. Once in place and under the proper circumstances the catheter tube 29, which is customarily a hollow tube of relatively resilient material, can be inserted through the slot 25. During initial stages of the insertion the locking plate 30 is rotated in a counter-clockwise direction so that the concave arcuate edge 32 is relatively clear of the slot. The opening thus provided is substantially larger than the outside circumference of the catheter tube. In this open position the locking plate will be held relatively stationary against inadvertent rotation by the locking arm which is normally biased into locking position by use of the torsion spring 40. After the catheter tube has been slid partially into position, it may become desirable to hold it fast. This can be accomplished by rotating the locking plate clockwise until the arcuate edge 32 presses into the circumference of the catheter tube. Once in position, the locking arm will continue to be urged into locking position and hold

the parts in that chosen position. Should it be desired at any time to release the catheter tube from locked position, the technician can accomplish this without removing his hands from other positions of manipulation by merely tilting the lock arm 35 by use of one of his fingers, for example, the little finger, whereupon the locking plate will immediately be released and the resiliency of the catheter tube will be sufficient to push the locking plate sufficiently in a counter-clockwise direction, as viewed in Figures 1 and 2, to move it out of locked position. The lock plate can be still further rotated by use of one of the fingers and as promptly as the lock arm is released, it will immediately resume a position locked against the locking plate and thus hold it in released position.

It will be appreciated that with the combination of elements herein described, the mouth is kept continuously open by operation of the stub 17 and inasmuch as this stub is hollow forming as it does the passageway 21, any accumulation of saliva in the patient's mouth during the course of the procedure can be extracted by use of a conventional tube inserted into the mouth through the passageway. Moreover, the locking effect upon the catheter tube is sufficiently strong and positive to effectively prevent inadvertent swallowing of the tube even though there might be an undue accumulation of saliva on its exterior. The simple effective arrangement of the working parts of the device as herein described is such as to permit construction of the instrument in a rugged dependable fashion and likewise construction of such material that it can be promptly sterilized whenever needed.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

I claim:

1. An endotracheal tube holder and bite block assembly for retention of a tube comprising a face plate, a hollow tube of rigid material at one side of the plate and means forming a continuous air passage through said plate and said tube, means forming a laterally open slot on the other side of the face plate extending inwardly from one edge, a locking plate pivotally mounted on the face plate having a tube engaging edge, said edge having one position of adjustment adjacent the bottom of the slot, a locking cam track on the locking plate, and a lock arm pivotally mounted on the face plate, said arm having an eccentric arcuate cam track thereon, said cam tracks having a successive series of locking positions in engagement with each other whereby said locking plate is locked alternatively in tube engaging and tube releasing positions.

2. An endotracheal tube holder and bite block assembly for retention of a tube comprising a face plate, said plate having opposite sides formed in substantial conformance with the angle of the human face at the area of the mouth, a hollow tube of rigid material at one side of the plate and means forming an air passage there-through, means forming a laterally open slot on the other side of the face plate extending inwardly from one edge, a locking plate pivotally mounted on the face plate having a tube engaging edge, said edge having one position of adjustment adjacent the bottom of the slot, an arcuate circumferential exterior locking cam track on the locking plate, and a lock arm pivotally mounted on the face plate, said arm having an eccentric arcuate cam track thereon, said cam tracks having a successive series of locking positions in engagement with each other whereby said locking plate is locked alternatively in tube engaging and tube releasing positions, spring means operative on said arm normally biasing said arm to locking position against the locking plate.

3. An endotracheal tube holder and bite block assem-

5

bly for retention of a tube comprising a face plate of rigid non-metallic material, said plate having opposite sides formed in substantial conformance to the slope of the face at the area of the mouth, a hollow tube of rigid material at one side of the plate and means forming a continuous air passage through the plate and said tube, means forming a laterally open slot on the other side of the face plate extending inwardly from one edge, a locking plate pivotally mounted on the face plate having a concave arcuate edge having one position of adjustment adjacent the bottom of the slot, an arcuate circumferential exterior locking cam adjacent said cam edge and an arcuate cam track thereon, a lock arm pivotally mounted on the face plate, said arm having an eccentric arcuate cam track thereon positionable in engagement with the first cam track in a successive series of locking positions, a spring acting upon said arm normally biasing said arm to locking position against the locking plate whereby the locking plate is releasably locked by said locking arm.

4. An endotracheal tube holder and bite block assembly for retention of a resilient endotracheal tube comprising a face plate of rigid clear non-metallic material having a length and breadth greater than the length and breadth of an open mouth, said plate having opposite sides inclined at an angle to each other and in substantial conformance to the angle of the human face at the area of the mouth, a hollow tube of rigid material at one side of the plate and means forming a continuous air passage through said plate and the tube, means forming a laterally open slot on the other side of the face plate extending inwardly from an upper edge, a locking plate pivotally mounted on the face plate adjacent said slot having a concave arcuate edge having one position of adjustment adjacent the bottom of the slot, an arcuate circumferential exterior locking cam edge on said locking plate and an arcuate roughened wear-resistant cam track thereon, and a lock arm pivotally mounted on the face plate, said arm having a lip overlying said locking plate and having an eccentric arcuate cam track thereon positionable in engagement with the first cam track in a successive series of locking positions, a torsion spring engaging said arm and the face plate normally biasing said arm to locking position against the locking plate whereby the locking plate is releasably locked by said locking arm upon said resilient tube when extending through said slot, and a strap releasably secured to opposite sides of the face plate at locations removed from said locking arm, said locking plate and said hollow tube of rigid material whereby to attach said face plate to the head of a wearer.

6

5. A tube holding device for resilient tubes comprising a face plate, means forming a curved slot in said face plate open at an edge of the face plate and adapted for reception of a resilient tube extending through the face plate, a locking plate element pivotally mounted on the face plate, a concave edge on said locking plate having one adjusted position of resilient releasable engagement with a tube, and means for releasably holding said locking plate element in locking position comprising a locking plate follower element pivotally mounted on the face plate, cam tracks respectively on the locking plate element and the follower element in camming engagement, one of said tracks being eccentric relative to the pivotal mounting of the respective element, an arm on the follower element extending outwardly of the edge of the face plate and a spring on the one of said elements biased normally to rotate said respective element into locking position with the other element.

6. A tube holding device for resilient tubes comprising a face plate having upper and lower edges, means forming a curved slot in said face plate open at one of said edges and adapted for reception of a resilient tube extending through the face plate, a locking plate element pivotally mounted on the face plate, a concave edge on said locking plate having one adjusted position of resilient releasable engagement with a tube, and means for releasably holding said locking plate element in locking position comprising a locking plate follower element pivotally mounted on the face plate, said follower element having a lip overlying the locking plate element, cam tracks respectively on the locking plate element and the follower element in camming engagement, the tracks on said follower element being eccentric relative to the pivotal mounting of the respective element, an arm on the follower element extending outwardly of one of the edges of the face plate and a spring in engagement with the said follower element biased normally to rotate said respective element into locking position with the locking plate element.

References Cited in the file of this patent

UNITED STATES PATENTS

1,270,565	Teter	June 25, 1918
2,820,457	Phillips	Jan. 21, 1958
2,857,911	Bennett	Oct. 28, 1958

FOREIGN PATENTS

50	653,436	Germany	May 15, 1936
----	---------	---------	--------------